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DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ALGEBRA.

254. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

Sum to infinity the series $\frac{n^2}{(16n^2-1)^2}$ beginning with $n=1$.

Solution by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va.

$$\sum_{n=1}^{\infty} \frac{n^2}{(16n^2-1)^2} = \tfrac{1}{64} \sum \left[\frac{1}{(4n^2-1)^2} + \frac{1}{4n-1} - \frac{1}{4n+1} + \frac{1}{(4n-1)^2} \right]$$

$$= \tfrac{1}{64} \left[\left(\frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \frac{1}{9^2} \cdots\cdots \right) + \left(\frac{1}{3} - \frac{1}{5} + \frac{1}{7} - \frac{1}{9} \cdots\cdots \right) \right]$$

$$= \tfrac{1}{64} \left[\left(\frac{\pi^2}{8} - 1 \right) + \left(1 - \frac{\pi}{4} \right) \right] = \tfrac{1}{64} \left(\frac{\pi^2}{8} - \frac{\pi}{4} \right).$$

Also solved by G. W. Greenwood.

255. Proposed by O. E. GLENN, Ph. D., Springfield, Mo.

Let f be the binary cubic $a_0x_1^3 + 3a_1x_1^2x_2 + 3a_2x_1x_1^2 + a_3x_2^3$, $\Delta = (f, f)_2$ the covariant, the second transvectant of f over itself, and $R = 2[4(a_0a_2 - a_1^2) \times (a_1a_3 - a_2^2) - (a_0a_3 - a_1a_2)^2] = (\Delta, \Delta)_2$ = the second transvectant of Δ over itself. Then if $\Delta_{\kappa\lambda}$ is the Δ covariant for the cubic pencil $\kappa f + \lambda Q$, Q being the first transvectant of f over Δ we have $\Delta_{\kappa\lambda} = (\kappa^2 - \frac{1}{2}\lambda^2 R)\Delta$.

Solution by G. W. GREENWOOD, M. A., McKendree College, Lebanon, Ill.

If $R \neq 0$, we may reduce the quantic to the form $mX^3 + nY^3$.
Hence, $\Delta = 2mnXY$, $R = -2m^2n^2$, $Q = m^2nX^3 - mn^2Y^3$,

$$\kappa f + \lambda Q = (\kappa m + \lambda m^2 n)X^3 + (\kappa n - \lambda mn^2)Y^3,$$

$$\text{and } \Delta_{\lambda\kappa} = 2mn(\kappa^2 - \lambda^2 m^2 n^2)XY = (\kappa^2 - \tfrac{1}{2}\lambda^2 R)\Delta.$$

If $R = 0$, we may reduce the quantic to the form $3lX^2Y$.
Then $\Delta = -2l^2X^2$, $Q = 2l^3X^3$, $\kappa f + \lambda Q = 3\kappa lX^2Y + 2l^3\lambda X^3$.
Hence $\Delta_{\lambda\kappa} = -2\kappa^2 l^2 X^2 = \kappa^2 \Delta$.

Also solved by M. E. Graber.